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Cashless Economy and the Nigerian Experience

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Abstract
The paper establishes a relationship between predictors of a cashless Economy and a country's move toward a cashless economy. Data for this research were sourced from the Central Bank of Nigeria Statistical Bulletin and Bureau of Statistics. The study covered the periods between 1981 and 2013. The analysis employed ordinary least square to evaluate a set of factors which affect such move. The results as analyzed by EVIEW statistical software confirmed positive fundamental relationships among market discipline two years ago, financial inclusion in the past year, and previous move toward a cashless society and the move toward a cashless Economy. Standard of living had a negative impact on the move toward a cashless economy. The market discipline elasticity of Move toward a Cashless Economy was inelastic as Banks response has been below expectation towards reforms for Cashless Economy and finding alternatives. The lesser the time then the more inelastic Banks are to market discipline. Financial inclusion was found never a threat on the move toward a cashless Nigeria. The Financial inclusion move toward a cashless Economy is inelastic due to the inability of individuals, households, or groups to access appropriate financial services or products. Without this ability people are often referred to as financially excluded. Standard of living in Nigeria is a threat on the move toward a cashless Nigeria presently as the calculation of standard of living by real GDP per head does not translate to welfare of the citizens. To perform as expected, Banks should be given time to respond to market discipline. Given that financial inclusion is never a threat on the move toward a cashless Nigeria, Government should enable individuals, households, and groups to access appropriate financial services or products in terms of affordable credit, having less difficulty obtaining a bank account, not being financially at risk through not having home insurance, understand budget and manage money or plan for the unexpected, know how to make the most of their money. Government should try increasing disposable income ceteris paribus then the limit of such an Economy is a cashless Economy. Citizen's welfare should make its way into the top of Nigeria's priority list. One last additional point to wrap up is that what we do today defines our tomorrow. To be cashless and to sustain the cashless culture Nigeria should work on direction first and then think acceleration.
Keywords: Cashless economy, Standard of living, Market discipline, financial inclusion.

1. Introduction

Banking is becoming increasingly automated, with computer debiting and crediting accounts replacing the moving around of piece of paper (Sloman: 2006). One possible outcome of this replacement of labor by computers is the gradual elimination of cash from the economy – or so some commentators have claimed. The new policy on cash-based transactions (withdrawals) in banks, aims at reducing (**not eliminating**) the amount of physical cash (coins and notes) circulating in the economy, and encouraging more electronic-based transactions (payments for goods, services, transfers, etc.). If cards were to become more extensively used for small transactions, they could well reduce the need for cash.

Are Nigerians moving towards a cashless economy? Probably not. Cash is still the simplest and most efficient way of paying for a host of items, from your bus ticket to a newspaper to a packet of mints. What is more, another innovation is moving us in the direction of using more cash, not less! This is the cash machine. The spread of cash machines to virtually every bank branch and many larger stores and supermarkets has rapidly simplified obtaining cash at all hours from these machines, not only from your current account but also on your credit card. To what extent can this arrangement encourage or discourage the use of cash? So are we using more or less cash?

Against this backdrop the paper represents among others an examination of Nigeria's move towards a cashless economy that is the direction and not acceleration to cashless Economy and provides a framework for improvement in the process.

2. Synopsis of Related and Empirical Literature

2.1 Conceptual Review

The cashless concept aims at reducing (NOT ELIMINATING) the amount of physical cash circulating in the economy, and encouraging more electronic based transactions (payment of goods, services, transfers, etc.) (www.cenbank.org/cashless). Cashless economy equally aims at preventing Bank run (Sloman: 2006). The Cashless idea reduces your power to keep your purchasing power in paper currency (www.zerohedge.com/news/2015-05-19/cashless-society). Cashless society is a society where people cash less

of their money, do fewer transactions with cash or cheque; move into digital currency.[1]

What should count as money in a cashless economy? Whether digital or cash based Economy, money plays the same main purpose as a medium of exchange (Ndugbu: 2001) Money narrowly defined (M_1) as items that can be spent directly using cheques, debit cards, Internet, phone, etc. This is mathematically given as Cash in circulation (CC) plus Current account balances (DD). The cheques, debit cards and credit cards although used to pay for goods directly, do not count as money. They are methods of payment. The balance in the account on which they are drawn counts as money. Broad definition (M_2) defined as the summation of narrow money, and Time and savings deposits (T)[2]. Cashless society answers two fundamental questions. First, what form is money held? And second, how is it spent in terms of method of payment?

Banking is becoming increasingly automated, with computer debiting and crediting of accounts replacing the moving around of pieces of paper. So are we moving towards a cashless society? Probably not. Cash is still the simplest and most efficient way of paying for a host of items, from your bus ticket to a newspaper to a packet of mints. Another technical innovation is moving us in the direction of using more cash not less! That is the cash machine (ATM). The spread of cash machines to virtually every Bank and large stores and supermarkets has been rapid in recent years. The sheer simplicity of obtaining cash at all account but also on your credit card, is a huge encouragement to the use of cash (Sloman: 2006). New technologies are trending viz. automated deposit machine {ADM} and automated loan machine {ALM}. An upgrade may be a right direction toward a cashless Nigeria.

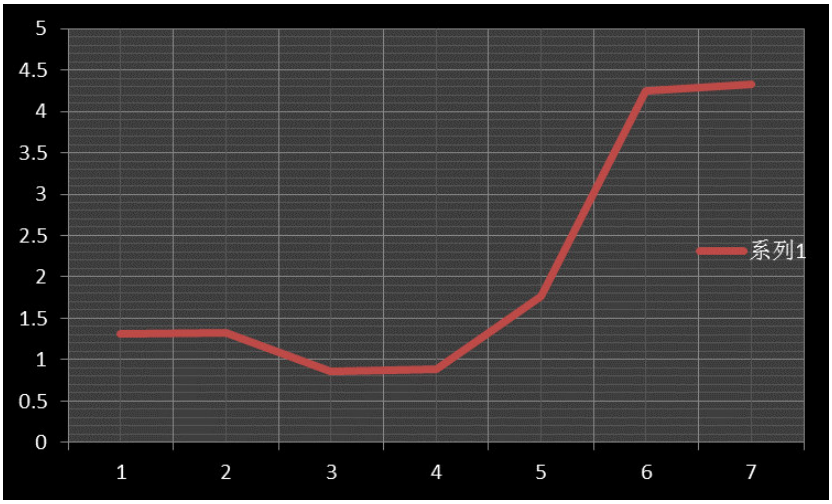

Figure 1: Nigeria's cashless preference overtime 1981 to 2013

Are we using more or less cash? Evidence suggests from figure 1 (1981 to 1995) that Nigeria pushed towards a cashless economy with cashless prefence averaging 1.167027. After 1995 Nigeria proceeded to move out from cashless preference to liquidity preference so that by 2010 ceiled at 4.252208. Even after the cashless policy by CBN in 2012 it has been on the increase but at a decreasing rate. The Nigerian Economy is too heavily cash-oriented in transactions of goods and services. This deviates from global trend, considering Nigeria's ambition to be amongst the top 20 economies of the world by year 2020. The retail cash policy commenced from June 2, 2012. The policy stipulated that over the counter cash transactions above ₦150,000 and ₦1,000,000 for individuals and corporate bodies respectively would attract a charge. The implementation of the policy commenced first in Lagos, and gradually extended to cover Pot Harcourt, Kano, Aba and Federal Capital Territory. The Central Bank of Nigeria did not place a limit on cash transactions in the banks rather formally encouraged banks to shift cost burden of heavy cash management to customers conducting high volumes of cash transactions in the banking halls.

Cashless Economy system is not entirely free. Using POS comes with a hefty price tag of 1.25 percent of the cost of every purchase or transaction that is effected in addition to the ₦5 for every ₦1000 commission on turnover deposit money banks are allowed by CBN to charge every time money is taken from merchant's account (Omose: 2011). Power is another key infrastructure issue. No law explicitly and exclusively deals with payment systems in Nigeria. This contrasts sharply with Kenya and South Africa, to name a few. Central Bank of Nigeria must be ready to invest heavily to make these transition possible. CBN must collaborate with EFCC to focus on high Government officials who launder the money and not little boys being atone with information technology tagging them "yahoo boys", As Nigeria policies have always been against the poor. Risk and Fears that a cashless system might lead to loss of jobs.

Cashless Economy is not without benefit. The World Bank says that "operating a cashless society in Nigeria was strategy for fast-tracking growth in the nation's "financial sector". Some expected benefits include:

[1] Mathematically: $\lim_{CC \to 2\%} (an\ Economy) = Cashless\ Economy$
Where cc = Cash in circulation

[2] There are broader money definitions.

Faster transactions, Improving hygiene on site – eliminating the bacterial spread through handling notes and coins, Increased sales, Cash collection made simple, Managing staff entitlements (http://www.wmcltd.com.co.uk/cashlesssystem?2011), Privacy, integrity, compatibility, good transaction efficiency, acceptability, convenience, mobility, low financial risk, anonymity (Keck, 2012). E-payment benefits businesses by extending customers base, boosting cash flow, enhancing customer service and improving competitive advantage (www.electronic-payments.co.uk). The government will benefit in the area of adequate budgeting and taxation, improved regulatory services, improved administrative processes (automation), and reduced cost of currency administration and management (Ashike: 2011), greater financial inclusion, and increased Economic development tool for tackling corruption. Checking money laundering and the insecurity of cash in transit (CIC)" (Ogu: 2011). That cash management in 2009 cost ₦114.5billion and this is projected to stand at ₦200billion in 2020 (Ezumba: 2011). Improve the effectiveness of monetary policy in managing inflation and driving economic growth. The new cashless policy was introduced according to the CBN for a number of key reasons, including: To drive development and modernization of our payment system in line with Nigeria's vision 2020 goal of being amongst the top 20 economies by the year 2020. Inefficiency and corruption: high cash usage enables corruption, leakages and money laundering, amongst other cash-related fraudulent activities. (www.cenbank.org/cashless/) Added to this is the perceived impact on the Naira. The system will reduce the pressure on the Naira. This can only happen if there is effective and standard cross-border electronic transmittal reporting system (Ezumba: 2011). Following from the above therefore, it is anticipated that the cashless system will bring with it transparency in business transactions (Jaiyeola: 2011). In the same token, the cashless economy will bring with it a leaning towards banking culture. It is seen that the effort is directed at "ensuring a 'cashless economy' and nurturing the culture of saving in the unbanked majority in the country" (Nonor, 2011). It appears that the most serious appeal of the cashless system comes from the high cost of cash management in Nigeria (Eboh: 2011).

The CBN's rhetoric of making the Nigerian economy cashless may be melodious. But that is placing the cart before the horse, an undue haste to run without first crawling. What foundations exist in Nigeria for the take-off of a cashless economy? What is the level of literacy and acquaintance with Information Communication Technology (ICT) among Nigerians? What infrastructures are there to support electronic banking, assuming most Nigerians are educated and ICT – compliant? Is it enough to flood the nooks and crannies with ATMs, with their vulnerability to fraud unresolved? (Ogu: 2011). "Those who have also frowned at the policy argue that the high level of illiteracy in the country, low level of banking population and porous banking system are factors that would work against the success of the scheme" (Dada and Oronsaye: 2011). It is pointed out that, "…the high level of illiteracy among Nigerians makes the use of cheques and electronic payments unsuitable in some cases" (Ogu: 2011). The current move by the country towards a cashless economy may end up being a fruitless exercise (Azeez: 2011). If the case is so with the more organized economies, it can only be imagined what can take place in an unorganized and vastly lawless economy like ours. Like the saying goes – "if gold rusts what will happen to iron?" Needed to migrate from a cash-aware Lagos to a cashless Lagos are not on ground. Unless the song coming from the CBN is not true, the road to a cashless Lagos is like the Ibadan Expressway, there are so many detours, so many potholes and gullies (Olaegbe: 2011).

2.2 Theoretical review

Money can be loosely defined as cash (coins and notes). Monetary theory is concerned with the role played by money in determination of certain key overall measures of how well the Economy is performing. It is a foundation for monetary policy (Ndugbu: 2001). Theories of Demand for and supply of money arise from two important functions of money, as medium of exchange and as a store of value. This means individuals and businesses wish to hold money partly as cash (cashless theory) and partly as assets. Thus cash can find its theory from monetary theory.

The traditional quantity theory of money transaction velocity approach by Irving Fisher, Centre on the equation of exchange which states an identity that total spending by buyer equals total receipt by the seller. Mathematically stated as:

$$M_Q * V = P * T$$

M_Q– Quantity of money in Economy. V – Velocity (average rate at which people spend their money.

T – Number of transaction. P – Average price.

The theory hypothesizes that holding M_Q and V constant the price level will fall as T rises because of Economic development (i.e. P = MV/T). P remains unchanged in the long run if the quantity of money M_Q grows at the same rate as T. If M_Q grows faster than T there will be a secular (long run) rise in price (i.e. Inflation). In the short run if M_Q decreases unemployment and business recession sets in/increases.

Modern quantity theory of money by Milton Friedman suggested that quantity of real money should be related to income, the cost of holding money and the utility or satisfaction associated with the services of money

balances as determined by tastes and preference. Mathematically:
$M_Q/P = f(Y_P, r_b, r_e, (DP)e/P, h, u)$
Where:
M_Q/P – real demand for money balance
Y_P – permanent income/long run average income
r_b - rate of return from bonds and other fixed interest securities
r_e – rate of return from equities
(DP)e/P – expected rate of inflation
h – ratio of human wealth to total wealth/proportion of wealth held as human capital
U – tastes and preferences

In Keynesian monetary theory, precautionary demand for cash hypothesizes that money is held between receipts and disbursement of income because of the costs of converting into and out of any other earnings assets which themselves are not generally acceptable as a medium of exchange. A firm or company {financial institutions precisely} has a business motive – to bridge the interval between time of incurring business obligation and receipts of sales proceeds. When the time lag between these intervals is small, less cash will be held for current transaction, and the converse argument holds (Ndugbu: 2001). Baumols analysis showed that it is expensive to tie up large amounts of capital in the form of cash balances. For that money can be used profitably elsewhere in the firm – it could be invested profitably in securities. The higher the interests rate on bonds, the lesser the transactions balances which a firm holds (that is working capital).

Keynesian transaction demand for money: $M_Q = f(T, r, b)$
Where:
T – value of total transaction r – interest rate b – brokerage fee

Baumols transaction demand for money: $M_Q = \sqrt{\left(\frac{2by}{r}\right)} * p$

r = f (market discipline). When market discipline increases interest rate decreases.

2.2.1 Theoretical framework

As established from the review of concepts, money supply is given as: $M_n = CC + DD + T + U$
Where M_n refers to the quantum of money in an economy, CC cash in circulation, DD the demand deposit in financial institutions, T the time and savings deposit in financial institutions, and U other forms of money apart from those identified.
Ceteris paribus $M_n = CC + DD$ ……...1
Cashless economy form: $M_n = 2\%M_n$ as CC + $98\%M_n$ as DD ……..2
If equation 1 is true, then the second question of how it is spent in terms of method of payment becomes ceteris paribus[1] 98% of transactions are discharged through means other than cash. From equation 1, proportion of money quantity people hold as cash and the proportion of money quantity people hold as balances at the bank: $1 = (CC/M_n) + (DD/M_n)$
Divide both sides by proportion of money quantity people hold as balances at the bank:
$1/(DD/M_n) = (CC/DD) + 1$
$(M_n/DD) = 1 + (CC/DD)$ ……..3
Equation 3 expresses cashless preference which is the number of times quantity of money covers Demand deposits or the proportion of demand deposit in the quantity of money. Given that M_n is always greater than DD, because CC cannot be negative. The farther above one M_n/DD the more liquidity preference an Economy becomes as the reciprocal DD/M_n becomes lower from the standard form of 98%. This is true as a variable and its reciprocal has an inverse relationship. M_n/DD can take either of two values at a time viz. equal to one (=1) meaning the economy is totally cashless or greater than one (>1) meaning the Economy is receding from being cashless. M_n/DD cannot be less than (<1) as CC cannot be negative. For a cashless economy recall from equation 2 quantity of money held as bank balances should be greater than or equal (≥) to 98% of total quantity of money its reciprocal of 1.02 is the standard quantity of money cover.
$(CC/DD) = (M_n/DD) - 1$ ……..4
Equation 4 expresses preference of public between currency and demand deposits.

From the traditional quantity theory of money (transaction velocity approach by Irving Fisher) the underlying cashless theory emerges when assumption of M_n been independently determined or a control variable is relaxed. Then $M_n = PT/V$. If V increases ceteris paribus M_n decreases, when M_n decreases unemployment increases. Standard of living (SOL) is a function of unemployment (U) and V is a function of SOL. What determines velocity? Ndugbu (2001) noted that velocity is a function of how often people are paid and spending habit (which in turn depends on change in spending pattern, population density, physical means of transporting money {trains and airplanes}, communication, standard of living and extent of the use of credit etc. when U

[1] Barring variables like withdrawals

increases ceteris paribus SOL decreases. If SOL decreases ceteris paribus V decreases. If V decreases ceteris paribus M_n increases. And so on. The point is $M_n = f(V) = g(SOL)$. Recall equation one Ceteris paribus $M_n = CC + DD$

Cashless preference: $M_n/DD = 1 + (CC/DD)$.

If SOL increases, what should we expect from cashless preference? As SOL decreases ceteris paribus V decreases and as V decreases 1 + (CC/DD) decreases. Law of cashless Economy hypothesizes that on average as standard of living decreases there is tendency to hold cash but not in same proportion of decrease in standard of living.

From the Modern quantity of Milton Friedman the underlying cashless theory is in the U that is Taste and preferences to be cashless or liquid, convenience and value of time consumed in making financial transactions and attitude toward risk (Ndugbu: 2001). Recall equation one Ceteris paribus $M_n = CC + DD$

Cashless taste and preference: $M_n/DD = 1 + (CC/DD)$ and Real cashless preference: $(M_n/DD)/P = (1 + (CC/DD))/P$. $(M_n/DD)/P = (1 + (CC/DD))/P$ is a function of (M_n/DD_{t-1}) where M_n/DD_{t-1} is past years Cashless taste and preference. Law of cashless Economy hypothesizes that on average as past year's cashless taste and preference increases there is tendency to have cashless taste and preference this year but not in same proportion of increase in past years cashless taste and preference. Real cashless preference is a function of convenience/inconvenience; value of time consumed in making financial transaction. Convenience and value of time consumed in making financial transactions can be proxied by financial inclusion. Hence, the Law of cashless Economy hypothesizes that on average as value of time in making financial transaction increases or the more inconvenient it is to make financial transactions then the lesser tendency to go cashless.

From the Baumols transaction demand for money the underlying cashless theory

The cashless preference: $M_n/DD = \left(\sqrt[\frac{1}{2}]{\left(\frac{2by}{r}\right)} * p\right)/DD$

$M_n/DD = 1 + (CC/DD) = \left(\sqrt[\frac{1}{2}]{\left(\frac{2by}{r}\right)} * p\right)/DD$

When a firm holds money for transaction it incurs interest cost. M_n is a function of market discipline. To create more connectivity $M_n = f(r) = g$ (market discipline). Note Keynes did not specify the role of r in this part of the analysis and many of his followers ignored it altogether. But William J. Baumol and James Tobin showed that r is an important determinant of transaction demand for money. sloman (2001) noted that there are many interest rate but there base has always been market discipline. As market discipline increases, ceteris paribus interest rate decreases and there is tendency toward cash preference. The Law of cashless Economy hypothesizes that on average as market discipline increases there is less tendency to go cashless.

2.3 Empirical review

Okoye and Raymond (2013) appraised cashless Economy policy in Development of Nigeria Economy. The study adopted descriptive research design with a sample size of 68. The convenience sampling technique was used. Questionnaire was structured as the main instrument for data collection. The data collected was subjected to face validity test, and was tested with ANOVA and chi – square (x^2). The results indicate that: majority of Nigerians are already aware of the policy and majority agree that the policy will help fight against corruption/money laundering and reduce the risk of carrying cash. Major problems envisaged to hamper the implementation of the policy are cyber fraud and illiteracy. Based on the findings recommendation was that the government should adopt a different strategy to educate the non-literate Nigerians about the cashless Economy; and a framework should be worked out to provide cyber security in Nigeria.

Ebeiyamba (2014) examined the effect of cashless Economy on micro and small scale business in Nigeria. He reviewed existing literature on the concept of cashless society and its effect on micro and small scale businesses. The study concluded that if necessary measures were not put in place and the necessary stakeholders to the policy carried along with considerations on how the policy might affect them, the cashless policy would adversely affect micro and small scale businesses and could engineer their failure.

In another study by Echekoba and Ezu (2012) on the problem of cash based economy and cashless policy in Nigeria, For effective cashless implementation in Nigeria availability of sufficient and well-functioning infrastructure (notably electricity), harmonization of fiscal and monetary policy, regular assessment of the performance of cashless banking channels, consideration of the present state and structure of the economy, redesign of monetary policy framework and greater efforts towards economic growth whilst managing inflation.

3. Methodology

This study follows an ex post facto design. The duration consideration, along military and democratic dispensation policies differential was cushioned with the assumption that duration is considered as being continuous (Davidson and Mackinon, 2004)

The data typology is time series data. The population is finite, composed of all deposit money banks operating in Nigeria financial superstructure. Data for the study is extracted from CBN statistical bulletin and bureau of statistics publications (2013). The sample size for analysis was done judgmentally, but encompasses times of major reforms ranging for a period of 33 years from 1981 to 2013. The data analysis technique is the econometric procedure applying the ordinary least square (OLS).

Towards achieving the research aforementioned objective, a single model was constructed. Capturing the essence of the conceptual and theoretical backgrounds, the move toward a cashless economy is estimated as 1 + (CC/DD). This expresses cashless preference. While the exogenous variables are factors that make or mar an economic system move toward a cashless economy. 1 + (CC/DD) is established to be a function of standard of living (SOL), financial inclusion (FICR) and past cashless preference. The construct is econometrically stated as:

$(1+CC/DD)_{2013} = \alpha_0 + \alpha_1 Sol_{2012} + \alpha_2 MD_{2011} + \alpha_3 FICR_{2012} + \alpha_4(1+CC/DD)_{2012} + u_{2013}$ ……1

dL_to_c_pref/dMD < 0;
dL_to_c_pref/dSol > 0;
dL_to_c_pref/dFicr < 0;
dL_to_c_pref/d L_to_c_pref > 0.

$(1+CC/DD)_{2013}$ - move toward cashless economy in 2013.
Sol_{2012} - standard of living in 2012.
MD_{2011} - market discipline in 2011.
$FICR_{2012}$ - financial inclusion in 2012.
$(1+CC/DD)_{2012}$ - move toward cashless economy in 2012.
u_{2013} - error term in 2013.

The predictand the move toward cashless economy is proxied by liquidity to cashless preference for reasons explained in the conceptual review. The predictor's market discipline, standard of living, financial inclusion and cashless preference in the past are proxied by cash reserve ratio, Gross Domestic Product per head, commercial Bank loan to rural area, and liquidity to cash preference in the past for reasons explained in the theoretical review. The shock as a term encompasses variables that impact on a cashless economy but not included in the model because of the principle of parsimony, vagueness of theory, unavailability of data, core variable with qualitative data, peripheral variables and proxy variables.

3.1 Diagnostic test

3.1.1 Brock, Dechert, Scheinkman (BDS) Independence Test

The BDS test is a portmanteau test for time based dependence in a series. The test here is applied to a shock series of estimated residuals to check whether the residuals are independent and identically distributed (*iid*). The dimensions 20 to 24 and 26 to 28 show the residuals are independent and identically distributed. As not all dimensions proved that, hence the iid hypothesis is rejected. This implies there is remaining structure in the series which could include nonlinearity, hidden nonstationarity. Prove of nonstationarity is tested using the first difference of the variables, then taking the BDS independence test of the residuals showed the residuals are iid. This issue will be addressed under stationarity and multicollinearity using the variance inflation factor.BDS serves as a signal.

3.3.2 Unit root test

A series is stationary if it has mean reversion $\{E(y_t) = \mu\}$, variances are constant overtime $\{Var(y_t) = \delta^2\}$ and if the covariance between two values from the series depends only on the length of time separating the two values, not on the actual times at which the variables are observed $Cov(y_t, y_{t+s}) = Cov(y_t, y_{t-s}) = y_s$ (covariance = f (s not t). the results of the three standard tests for unit roots in the variables of the model are reported in table 1. The table shows that variables are stationary only at first difference.

Table 1: the unit root test statistics

Variable	ADF test statistic			Phillips-perron			Kwiatkowski-phillips-schidt-shin		
	First difference			First difference			First difference		
	No intercept and trend	With intercept and trend	With intercept and without trend	No intercept and no trend	With intercept and trend	With intercept but no trend	No intercept and no trend	With intercept and no trend	With intercept and trend
L to C pref	-4.037837 *			-4.062926 *			0.235426 **		
Sol$_{2012-1}$		-3.815508 ***			-5.297298 ****				0.135382*****
Ficr$_{2012-1}$			-4.714541 *******			-4.824244 ********		0.370442 **	
Md$_{2012-2}$	-2.884387 ******				-4.447014 ***				0.095911*****
L to C pref$_{2012-2}$	-4.037837*			-4.062926 *				0.235426**	

*** Significant at 5% level. ADF critical value at first difference without intercept and trend = -1.952066.**
**** Significant at 5% level. KPSS asymptotic critical value at first difference without intercept and trend = 0.463000**
***** Significant at 5% level. ADF and Phillips-perrons critical value at first difference with intercept and trend = -3.574244**
****** Significant at 5% level. Phillip-perrons critical value at first difference with intercept and trend = -3.568379**
******* Significant at 5% level. KPSS asymptotic critical value at first difference with intercept and trend = 0.146000**
******** Significant at 5% level. ADF critical value at first difference without intercept and trend = -1.953381**
********* Significant at 5% level. ADF critical value at first difference with intercept but no trend = -2.971853**
********** Significant at 5% level. Phillips-perron critical value at first difference with intercept but no trend = -2.963972**

3.3.3 Cointegration Test

Table 3 presents results of the johansen cointegration tests for the cashless-economy model. Shows that the variables are cointegrated as indicated by trace and eigenvalue statistic greater than the critical value at 5% level.

Table 3: Johansen cointegration test result

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	1.000000	962.4898	60.06141	0.0001
At most 1 *	0.800966	72.70136	40.17493	0.0000
At most 2 *	0.530063	25.88722	24.27596	0.0311
At most 3	0.127173	3.987695	12.32090	0.7127
At most 4	0.001488	0.043189	4.129906	0.8648

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	1.000000	889.7885	30.43961	0.0001
At most 1 *	0.800966	46.81414	24.15921	0.0000
At most 2 *	0.530063	21.89953	17.79730	0.0114
At most 3	0.127173	3.944506	11.22480	0.6373
At most 4	0.001488	0.043189	4.129906	0.8648

3.3.4 Impulse response

An impulse response function traces the response to a one-time shock in the innovation. The accumulated response is the accumulated sum of the impulse responses. It can be interpreted as the response to step impulse where the same shock occurs in every period from the first. Impulse response shows the effects of shocks on adjustment path of the variables.

There are four possible shocks to the system, with sixteen impulse responses. However, this study focuses on four – the effect of a shock to move toward cashless preference on the time paths of cashless preference, market discipline, Standard of Living and financial inclusion[1]. The impulse response of the shock (or innovation) to Nigeria's move toward cashless preference in 2011 on Nigeria's cashless preference in 2012 is

[1] Assume errors $v_{2012}^{l\_to\_c\_pref}$, v_{2012}^{md}, v_{2012}^{sol}, and v_{2012}^{ficr} are independent of each other (contemporaneously uncorrelated) in addition we assume $v_{2012}^{l\_to\_c\_pref} \sim N(0,\delta^2_{l\_to\_c\_pref})$, $v_{2012}^{md} \sim N(0,\delta^2_{md})$, $v_{2012}^{sol} \sim N(0,\delta^2_{sol})$, and $v_{2012}^{ficr} \sim N(0,\delta^2_{ficr})$. $l\_to\_c\_pref_0 = md_0 = sol_0 = ficr_0 = 0$

$\delta_{l\_to\_c\_pref}$ {0.115254, 0.180314, 1.514453, -15.60442, 239.5506, -3521.806, 51969.27, -766644.9, 11309739, -1.67E+08} after the shock cashless preference in 2012 initially soars by full amount of the shock and then it gradually plummets to the value before the shock but dissipates well under the value before the shock, subsequently swing from positive to negative on average of one to two periods. The impulse response of the shock (or innovation) to Nigeria's cashless preference in 2011 on market Discipline in 2012 is $\delta_{l\_to\_c\_pref}$ { 0.000000, 0.089680, -1.682688, 24.00667, -355.6625, 5244.647, -77373.21, 1141423, -16838539, 2.48E+08} the shock had delayed impact. The shock subsequently rises by 8.9% then follows the swing as the shock does not die off. The impulse response of the shock (or innovation) to Nigeria's move toward a cashless preference in 2011 on Nigeria's market discipline in 2012 is $\delta_{l\_to\_c\_pref}$ {0.000000, 0.479280, -7.397578, 109.0871, -1610.275, 23754.33, -350430.9, 5169635, -76263622, 1.13E+09} The impulse response of the shock (or innovation) to Nigeria's cashless preference in 2011 on Nigeria's financial inclusion in 2012 is $\delta_{l\_to\_c\_pref}$ {0.000000, 0.069936, -1.761181, 25.28099, -374.5222, 5523.534, -81486.72, 1202108, -17733775, 2.62E+08}

3.3.5 Variance Decomposition

While impulse response functions trace the effects of a shock to one endogenous variable on to the other variables in the VAR, *variance decomposition* separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR. variance decomposition analysis is informative about the sources of volatility.

Table 4: variance decomposition in cashless preference

Period	S.E.	L_TO_C_PREF	MD(-2)	SOL(-1)	FICR(-1)
1	0.115254	100.0000	0.000000	0.000000	0.000000
2	0.510058	6.732887	3.091393	88.29572	1.879998
3	8.401147	2.546703	4.462119	88.23358	4.757598
4	123.7883	1.924183	4.327279	88.95437	4.794170
5	1827.738	1.957686	4.334870	88.90064	4.806803
6	26962.97	1.955044	4.334003	88.90386	4.807091
7	397765.5	1.955205	4.334049	88.90361	4.807141
8	5867926.	1.955192	4.334044	88.90362	4.807142
9	86564968	1.955193	4.334044	88.90362	4.807142
10	1.28E+09	1.955193	4.334044	88.90362	4.807142

Decomposing the total variance of the forecast error, at least 88.3% of the corresponding one-step to the tenth-step ahead forecast error variance of Cashless preference is due to Standard of living in the past year shock. While financial inclusion in the past year, market discipline in the past two years and Cashless preference own shock explain the remaining variance of 11.7%.

3.3.6 Variance Ratio Test

Lo and MacKinlay variance ratio test was performed to determine whether differences in a series are uncorrelated, or follow a random walk or martingale property. Variance ratio test Examines the predictability of time series data by comparing variances of differences of the data (returns) calculated over different intervals. The "Joint Tests" are the tests of the joint null hypothesis for all periods, while the "Individual Tests" are the variance ratio tests applied to individual periods.

Z statistic = (1-vaiance ratio)/standard error

Of interest is whether Cashless preference is not random walk i.e. not martingale). Here, the Chow-Denning Maximum |z| Statistic of 4.30728 is associated with the period 12 individual test. The approximate *p*-value of 0.0001 is obtained using the studentized maximum modulus with infinite degrees of freedom so that we strongly reject the null of a random walk. Similar conclusion is reached for market discipline in 2010 with maximum |z| of 4.792839.

The other chow-Denning maximum |z| statistics are financial inclusion in the past year 15.09275, Standard of Living in the past year 13.24399, and Cashless preference for past two years 4.444180 are not random walk. From the joint test of each chow-Denning Statistic we conclude the series are not martingale, thus are predictable.

3.2 Regression result and interpretation

Table 5: Regression result for cashless economy model

Dependent Variable: Cashless Economy

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.086662	0.236328	4.598115	0.0002
MD(-2)	0.033414	0.018621	1.794420	0.0887
FICR(-1)	2.98E-07	9.88E-08	3.013655	0.0071
SOL(-1)	-3.610227	0.871030	-4.144779	0.0006
L_TO_C_PREF(-2)	0.558686	0.142784	3.912801	0.0009
L_TO_C_PREF(-7)	-0.866300	0.252642	-3.428966	0.0028

R-squared	0.921477	Mean dependent var	0.740841
Adjusted R-squared	0.900814	S.D. dependent var	0.388718
Durbin-Watson stat	1.670304	Akaike info criterion	-1.157116
Hannan-Quinn criter.	-1.075980	Schwarz criterion	-0.864585

The cashless model variables had expected signs except for standard of living and no autocorrelation between the disturbances as the Durbin-Watson tends to 2. Jarque-bera test[1] shows the residual series are normally distributed. The F-statistic of 0.435, Observed R-squared of 0.3709 and the Scaled explained SS of 0.8197 indicates homoscedasticity with the variance independent on the predictors. The centered variance inflation factor [2] 1.216666 for market discipline in 2010, 5.097636 for standard of living in 2011, and 3.102943 for financial inclusion indicate no multicollinearity. The model is plausible as 90% variation in Cashless preference is explicated by predictors. Barring all factors moving an Economy to be Cashless, Cashless preference movement over the period autonomously averages 4.598115 per annum absolutely.

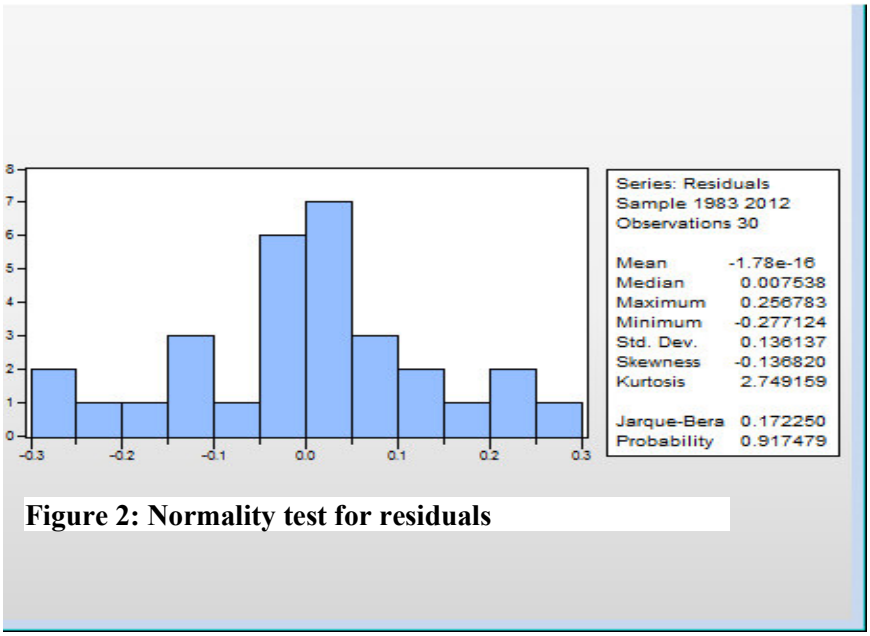

Figure 2: Normality test for residuals

Table 5 shows positive relationship between market discipline in 2010 and Cashless Economy (the cointegration indicates that this relationship is fundamental not spurious). The relationship is statistically significant at 10% level. The magnitude of the impact is small. On average a one percent increase in market discipline, leads to about 0.033414 increase toward a cashless economy absolutely. The market discipline elasticity of Move toward a Cashless Economy is inelastic as epsilon 0.269232 is less than 1 as Banks' response have been below expectation towards reforms for Cashless Economy and finding alternatives as Dada and Oronsaye said. The lesser the time then the more inelastic Banks are to market discipline.

Table 5 shows positive relationship between financial inclusion in 2011 and the move toward a Cashless Economy. The relationship is statistically significant at 1% level. The magnitude of financial inclusion for the past year in Nigeria on the move toward a cashless Nigeria is small but with the right direction. For an

[1] Jarque-Bera = $N/6(S^2 (K-3)^2/4$ where S is the skewness, and K is the kurtosis.

[2] The centered VIF is numerically identical to $1/(1-R^2)$ where R^2 is the R-squared from the regression of that regressor on all of the other regressors in the equation. Variance inflation factor rule of thumb: VIF(b_k) > 10 is an indication of multicollinearity.

increase in financial inclusion of 1percent, on average leads to about 1.56153E-12 (constant semi-elasticity) move toward a cashless Economy but 2.98E-07 absolutely. This indicates that financial inclusion is never a threat on the move toward a cashless Nigeria. That aligns with the cashless economy theory derived from the monetary theory that as convenience increases, time consumed in making financial transactions decreases and inconvenience decreases then the limit of such an economy is a cashless economy. The financial inclusion elasticity of move toward a cashless economy is inelastic in Nigeria as epsilon 0.07758 is less than 1. This may be due to the inability of individuals, households, or groups to access appropriate financial services or products. Without this ability people are often referred to as financially excluded (not able to access affordable credit, having difficulty obtaining a bank account, financially at risk through not having home insurance, struggle to budget and manage money or plan for the unexpected, not knowing how to make optimal use of their money).

Table 5 also shows that relationship between standard of living in 2011 and the move toward a cashless Economy is statistically significant at 1% level. The magnitude of standard of living in Nigeria as we move toward a cashless economy is small and with the wrong direction. For an increase in standard of living of one percent, on average leads to about 54.41545 (constant semi-elasticity) anti-move toward a cashless economy in Nigeria presently but 3.610227 absolutely. This indicates that standard of living in Nigeria is a threat to the move toward a cashless Nigeria presently. That aligns with the cashless Economy theory derived from the monetary theory on velocity as function of disposable income by Irving Fisher. As disposable income increases ceteris paribus one's standard of living increases then the velocity also increases (simply put do not talk about cashless to people who do not even see cash) then the limit of such an economy is a cashless Economy(as you no longer feed from hand to mouth or rather feed above a dollar per day). Secondly, the calculation of standard of living by real GDP per head does not translate to welfare of the citizens (Sloman: 2006)(simply put, that Nigeria's Economy is number one Economy in Africa as calculated by their GDP does not mean that every citizen is having a share of the cake). The standard of living elasticity as a move toward a cashless Economy is inelastic in Nigeria as epsilon 0.3208 is less than 1.

One last additional point to wrap up this study is that the additional variables added to cure autocorrelation malady show that at 1% level of significance and with the right direction (showing impact direction of present reforms), the move toward a cashless Economy last year and last two years impacts on such move presently. Simply put, what we do today defines our tomorrow. We should emphasize on infrastructural development as it constitutes a sine qua non for the realization of a cashless economy. As in the words of Echekoba and Ezu, "let's talk infrastructure first".

4. Policy lessons and conclusion

Normatively, Nigeria wants to be cashless but been positive we are not. There is a slow rate of adjustment from the move toward a cashless Economy to equilibrium. The impulse response of innovation to Nigeria's cashless preference on factors affecting it initially rises though some have a delayed impact but subsequently follows a positive negative swing as the shock does not die off. A cashless society impinges much on Standard of living.

The Banks should be given time to respond to market discipline. With time such reforms will be matched to expectation. Given that financial inclusion is never a threat on the move toward a cashless Nigeria, Government should enable individuals, households, and groups access appropriate financial services or products in terms of affordable credit, having less difficulty obtaining a bank account, not being financially at risk through not having home insurance, understand budget and manage money or plan for the unexpected, know how to make optimal use of their money. Since the work saw standard of living in Nigeria presently as threat on the move toward a cashless Nigeria, Government should try increasing disposable income ceteris paribus then the limit of such an Economy is a cashless Economy. Secondly, the calculation of standard of living by real GDP per head does not translate to welfare of the citizens. Citizen's welfare should make its way into the top of Nigeria's priority list. One last additional point to wrap up this paper is that what we do today defines our tomorrow. To be cashless and to sustain the cashless culture Nigeria should work on direction first and then think acceleration.

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Table array of exogenous and endogenous variables

Table 2: table array of data with predictand variable (Cashless Economy) with predictor (Standard of Living, Market Discipline and Financial Inclusion)

year	Cashless Economy (ratio)	Standard of Living (ratio)	Market Discipline (ratio)	Financial Inclusion (million)
1981	0.780893	6.29E-05	9.5	35.9
1982	0.850078	6.31E-05	10.7	44.2
1983	0.852183	6.66E-05	7.1	58.2
1984	0.747871	7.29E-05	4.7	114.9
1985	0.63213	0.000809	1.8	373.6
1986	0.724342	8.03E-05	1.7	492.8
1987	0.821852	0.000119	1.4	659.9
1988	0.849346	0.000153	2.1	3721.1
1989	0.689703	0.000233	2.9	4730.8
1990	0.706621	0.00028	2.9	5962.1
1991	1.023876	0.000318	2.9	1895.3
1992	1.096006	0.005294	4.4	10910.4
1993	1.11371	0.006633	6	1602.2
1994	1.313301	0.008505	5.7	8659.3
1995	1.302573	0.017834	5.8	4411.2
1996	1.242705	0.024305	7.5	11158.6
1997	1.169852	0.024579	7.8	11852.7
1998	1.179069	0.023169	8.3	7498.1
1999	1.130304	0.026661	11.7	11150.3
2000	0.948849	0.037283	9.8	12341
2001	0.708463	0.037501	10.8	8942.2
2002	0.691819	0.053501	10.6	11251.9
2003	0.506704	0.064005	10	34118.5
2004	0.525859	0.083905	8.6	16105.5
2005	0.484641	0.104386	9.7	24274.6
2006	0.399424	0.129551	2.6	27263.5

2007	0.307308	0.140335	2.8	46521.48
2008	0.225159	0.16069	3	13575
2009	0.226715	0.159551	1.3	15590.5
2010	0.241101	0.182879	1	16555.98
2011	0.225305	0.39801	8	2729796
2012	0.212615	0.432225	12	3065156
2013	0.259993	0.477285	12	3221815

Source: CBN statistical bulletin and bureau of statistics, December 2013.

Note	Estimated by:	
Cashless economy	1 + (CC/DD) Where CC – Cash in circulation DD – Demand deposit in financial institutions	Measures cashless preference of an economy.
Standard of living	Gross Domestic Product (GDP) per head =nominal GDP/economies population	Measures the quality of life, level of wealth, comfort, material goods and necessities available to a certain socioeconomic class in a certain geographic area.
Market discipline	cash reserve ratio =cash reserves/total deposits	Measures The onus on the banks, financial institutions and sovereigns to conduct business while considering the risks to their stakeholders.
Financial inclusion	commercial Bank loan to rural area	Measures the ability of an individual, household, or group to access appropriate financial services or products. Without this ability people are often referred to as financially excluded (not able to access affordable credit, having difficulty obtaining a bank account, financially at risk through not having home insurance, struggle to budget and manage money or plan for the unexpected, not know how to make the most of their money)

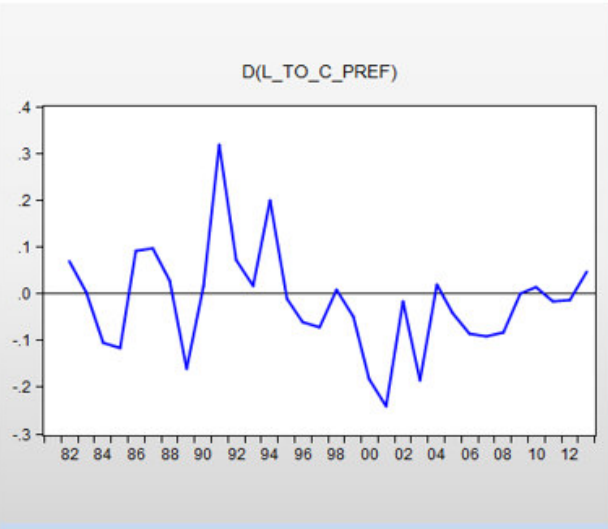

Fig 1: liquidity to cash preference first difference graph

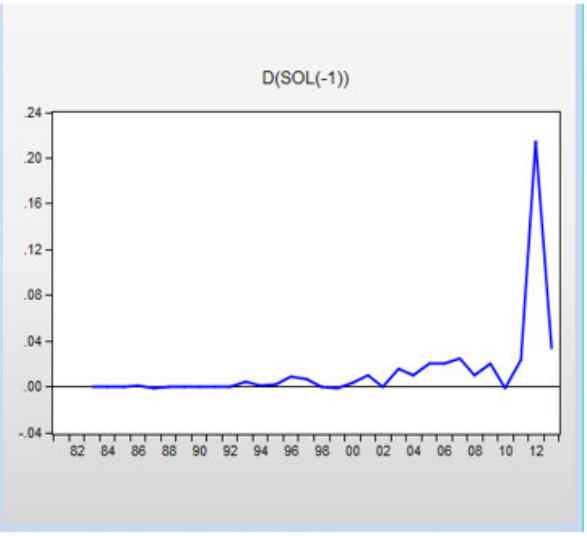

Fig 3: standard of living first difference graph

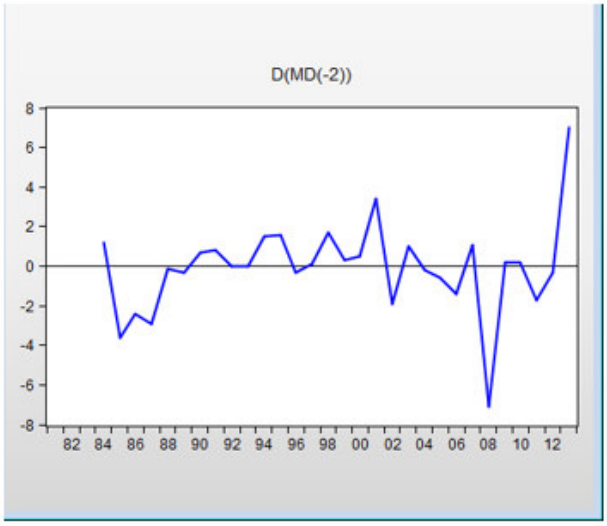

Fig 4: market discipline first difference graph

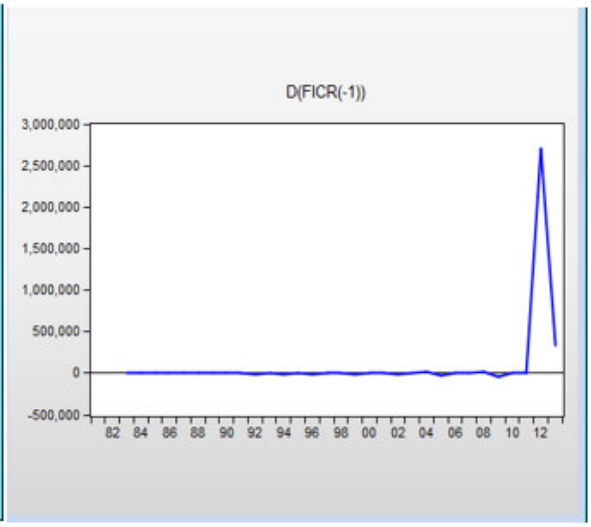

Fig 4: commercial bank credit to rural area first difference

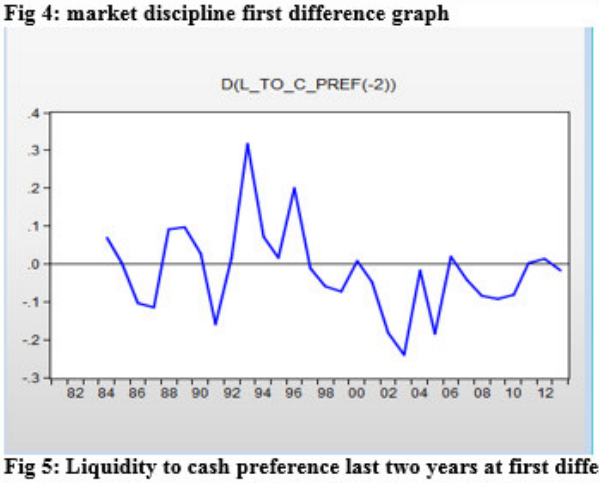

Fig 5: Liquidity to cash preference last two years at first difference